SEPT 1982

THEMATIC MAPPER

THEMATIC MAPPER

Prepared for
GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland 20771
CONTRACT NAS 5-24200

FLIGHT MODEL
PRESHIPMENT REVIEW
DATA PACKAGE
VOLUME I - SUMMARY REVIEW

Article IV - 3A

HUGHES
HUGHES AIRCRAFT COMPANY
SPACE AND COMMUNICATIONS GROUP

HS 236-0019-1679

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THEMATIC MAPPER

FLIGHT MODEL
PRESHIPMENT REVIEW

VOLUME I

TABLE OF CONTENTS

1.0 INTRODUCTION

This data package is submitted to the NASA/GSFC in compliance with and to fulfill the requirements of Article IV, Section 3-A, Documentation for Formal Reviews, of contract NAS5-24200. The data package is for support of the Thematic Mapper Flight Model Preshipment Review.

The data package was assembled in accordance with the requirements of attachment 2 to the contract, and contains all pertinent information or references to provide a thorough understanding of all technical aspects of the Flight Model test program.

The data package is organized into four volumes of material. Volume I contains data to provide a review of the Flight Model test program, with summary descriptions of tests, test plans, test results, and comparisons of results to requirements. Summary charts of Failure Reports and Requests for Deviation/Waiver are included.

Volume II includes reference lists to Acceptance data for each of the major subsystems, including Configuration Reports, lists and copies of all Failure Reports, and Requests for Deviation/Waiver. Volume III contains reference data for each of the tests performed at the system level with summary lists of liens.

Volume IV is a set of appendices that include reference documentation to supplement the data presented in Volumes II and III. The material is organized in the sequence used for Volumes II and III, with the section numbers identical to those volumes. The summary test reports for the system level tests are included in particular sections of Volume III; other pertinent data, as referenced in those sections, are included in the appendices.

SECTION 2.0

DESIGN STATUS

2.1. "As-Built Configuration List

An "as-designed" configuration list for each of the subsystems of the Flight Model Thematic Mapper is included in Volume II of this Data Package. The attached list shows the final drawing revision of the various subsystems, or the "as-built" configuration.

AS-BUILT CONFIGURATION LIST

THEMATIC MAPPER ASSY
51065 S/N 003

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
1	51065	THEMATIC MAPPER ASSY	J	J	J	003
			4257A	4257A	4257A	
			4487A	4487A	4487A	
			4557A	4557A	4557A	
			4573A	4573A	4573A	
			4643A	4643A	4643A	
			4658A	4658A	4658A	
			D143R1	D143R1	D143R1	
			D144	D144	D144	
			D146	D14[illegible]	D146	
			D148	D14[illegible]	D148	
			D155	D155	D155	
			D158	D158	D158	
			D161	D161	D161	
			D162	D162	D162	
			D163	D163	D163	
			D164	D164	D164	
			D165	D165	D165	
			W166	W166	W166	
			W169	W169	W169	
			W170	W170	W170	
			W171R1	W171R1	W171R1	
			W173	W173	W173	
			W174	W174	W174	
			W175	W175	W175	
			W176	W176	W176	
			W177	W177	W177	
			W168	W168	W168	
2	3533002-100	SCAN MIRROR ASSY	E	D	D	004
				13121	13121	
				13122	13122	
				64358	64358	
				64363	64363	
				64369	64369	
				64374	64374	
				W020	W020	

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
2	51531	BASE, ALIGNMENT CUBE	A	A	A	
2	51532	PLATE, ALIGNMENT CUBE	A	A	A	
2	51740-1	RADIATIVE COOLER DOOR ASSY	E 4230A 4260A 4362A 4373A 4449A 4463A 4528A	E 4230A 4260A 4362A 4373A 4449A 4463A 4528A	E 4230A 4260A 4362A 4373A 4449A 4463A 4528A	003
2	51770	RADIATIVE COOLER SHROUD	B	B	B	003
2	51837	MANIFOLD, PURGE	A	A	A	
2	51877	COVER, RIGHT HAND	E 3317A	E 3317A	E 3317A	
2	51878	COVER, LEFT HAND	E 3318A	E 3318A	E 3318A	
2	51899	BRACKET, HEATSINK	A	A	A	9,12
2	52016	COVER=SCAN MIRROR	C	C	C	
2	52052-3	SHIM, COOLER SHROUD	B 3209A	B 3209A	B 3209A	
2	52053	SHIM, COOLER DOOR, LWR	C 3351A	C 3351A	B	
2	52347	ELECTRONICS MODULE ASSY	D 4588A	B 4091A 4113A 4242A 4293A	B 4091A 4113A 4242A 4293A	201

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
2	52364	RETAINER, LOUVER	B 9448 2119A	B 9448 2119A	B 9448 2119A	
2	52532	OPTICAL ASSY	F 3174A 4100A 4187A 4266A 4488A 4656A 4559A D-154 W-148	F 3174A 4100A 4187A 4266A 4488A 4656A 4559A D-154 W-148	F 3174A 4100A 4187A 4266A 4488A 4656A 4559A D-154 W-148	003
2	52566-2	HEATER STRIP-SMA	C	C	C	
2	52566-3	HEATER STRIP-SMA	C	C	C	
2	52569	COVER, COOLER SHROUD	B	B	B	
2	52660	SUNSHADE ASSY	D	D	C	
2	52690	COVER, CABLE	B	A 9963	A 9963	
2	52722	THERMISTOR ASSY	D	D	D	
2	52753-1	THERMISTOR BLOCK ASSY	D 3794A W-139	D 3794A W-139	D 3794A W-139	302
2	52832	TUBE, PURGE LINE	A	A	A	
2	52833	TUBE, PURGE LINE	A	A	A	
2	52836	CLAMP, PURGE LINES	B	B	B	
2	52922	BRACKET, CABLE COVER	A	A	A	

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
2	53286	CABLE ASSY	D	D	D	202
2	53287-1	CABLE ASSY-SENSOR	B 2171A 2958A 2974A 3780A 4671A	B 2171A 2958A 2974A 3780A 4671A	B 2171A 2958A 2974A 3780A 4671A	202
2	53287-2	CABLE ASSY-SENSOR	B 2171A 2958A 2974A 3780A 4671A	B 2171A 2958A 2974A 3780A	B 2171A 2958A 2974A 3780A	202
2	53288	CABLE ASSY-COOLER DR	B 2945A 3727A 3800A	B 2945A 3727A 3800A	B 2945A 3727A 3800A	201
2	53938	SUPPORT, MANIFOLD TUBE	A	A	A	
2	53939	TUBE, MANIFOLD	A	A	A	
2	53803	SHIM, COOLER DOOR UPPER	B 3383A	B 3383A	A	
2	54004	CABLE ASSY	D 3985A 4149A	D 3985A 4149A	D 3985A 4149A	201
2	54028	SHIM	B	B	A	
2	54058	TERMINAL BOARD ASSY	B	B	B	
2	54059	SHIM, CONTROLLER	A	A	A	
2	54160	SCREW, RELIEVED	A	A	A	
2	54233-2	SWITCH ASSY	A 3504A	A 3504A	A 3504A	

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
2	54311	BRACKET, MOUNTING	A	A	A	
2	54345	COVER, BOTTOM, FRAME	A	A	A	
2	54364	SPACER, COVER	A	A	A	
2	54411	STANDOFF, HEX	A	A	A	
2	54533	PLUG, SHORTING	A	A	A	201
2	TP32015-204	KINETIC KNIFE EDGE ATP	B	B	B	
2	TP32015-206	B07 SOFTWARE ATP FOR SELLOFF	B	B	B	
2	TP32015-208	AC02 SOFTWARE ATP	B	B	B	
2	TP32015-209	SPATIAL COVERAGE SOFTWARE ATP	-	-	-	
2	TP32015-214	PHASED KNIFE EDGE SOFTWARE ATP	A	A	A	
2	TP32015-216	BL19/20 SIV SOFTWARE TP	A	A	A	
2	TP32015-506	SCAN MIRROR TO RADIOMETER ALIGNMENT TEST PROC	D	D	D	
2	TP32015-512	GAINSET, RADIOMETRIC CALIB BANDS 1-5 & 7, OBC CALIB	D	D	D	
2	TP32015-514	SPATIAL COVERAGE TEST PROC	B	B	B	
2	TP32015-517	RADIOMETRIC CALIB VERIF	A	A	A	
2	TP32015-518	RADIOMETRIC CALIB SENSITIVITY OBC CALIB BAND 6, BL10R	A	A	A	
2	TP32015-520	COHERENT NOISE MEASUREMENT, BL12R	-	-	-	
2	TP32015-522	SQR WAVE RESPONSE, BL16R	B	B	B	
2	TP32015-523	SQR WAVE RESPONSE, BL17R	B	B	B	

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
2	TP32015-525	BAND TO BAND REGISTRATION/ GEOMETRIC ACCURACY/SELF-INDUCED VIBRATION TP	A	A	A	
2	TP32015-529	SPECTRAL MATCHING, AC22R	A	A	A	
2	TP32015-530	TM INTERFACE ALIGNMENT PLAN	A	A*	A	
2	TP32015-531	TM POWER & GROUND TP	-	-	-	
2	TP32015-532	TM COMMAND & TELEMETRY	-	-	-	
2	TP32015-533	TM VIDEO & SYSTEM TIMING TP	-	-	-	
2	TP32015-607	TM INSTRUMENT PURGE PROCEDURE	-	-	-	
2	TP32015-608	TM MOVING, HANDLING & TRANS	C	C	C	
2	TP32015-609	VIBRATION TEST PROCEDURE	A	A	A	
2	TP32015-621	SYSTEM READINESS TEST	C	C	C	
2	TP32015-622	TM EMI TEST PLAN/PROCEDURE	A	A	A	
2	TP32015-623	FLIGHT ACOUSTIC TEST PROC	B	B	B	
2	TP32015-625	THERMAL VACUUM TEST PROC	C 4604A	C 4604A	C 4604A	
2	TP32015-629	EMI/EMC TEST PROC	-	-	-	
2	16357	PROCEDURE FOR GENERAL MECHANICAL ASSY	B	B	B	
2	16912	RADIATIVE COOLER DOOR LIMIT SWITCH ADJUSTMENT	C	C	C	
2	16945	CONTAMINATION MONITORING OF TM OPTICAL COATINGS	B 4093A	B 4093A	B 4093A	

IND LVL	PART NO.	NOMENCLATURE	CURRENT REVISION	ACCEPT. REVISION	AS-BUILT REVISION	SERIAL NUMBER
2	16962	PROCEDURE FOR ALIGNMENT OF ALIGNMENT CUBE	B 3242A	B 3242A	B 3242A	
2	16980	PROCEDURE FOR DETERMINATION COOLER SHROUD SHIM THICKNESS	B 3362A	B 3362A	B 3362A	
2	50840	MAIN FRAME ASSY	E	E	E	003
2	51348	CONTROLLER, THERMAL	B	B	B	
2	51530	CUBE, ALIGNMENT	A	A	A	
2	3569563	BLANKET INSTALLATION	A 4399A	A 4399A	A 4399A	003

4-17-82
Quality Assurance

9-20-82
Configuration Management
E.J. Vergara

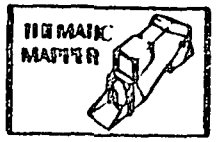
Section 3.0
Performance Analysis

3.1 REVIEW OF REQUIREMENTS

The first part of the following series of charts lists the requirements applicable to the Flight Model Thematic Mapper (with reference to specification 400.8-D-210, Revision B) and the method used for verification of the requirement.

The second part of the series of charts lists the Interface Control Document requirements, and the method used to verify compliance.

3.1.1 SPECIFICATION REQUIREMENTS MATRIX

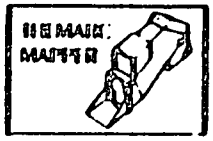


F-1 SPEC REQUIREMENTS COMPLIANCE MATRIX

SPEC 400.8-D-210, REV B

SBRC

SPEC PARAGRAPH	REQUIREMENT	VERIFICATION METHOD	COMMENTS
3.0	REQUIREMENTS		
3.1	GENERAL SYSTEM DESCRIPTION		
3.2	SYSTEMS REQUIREMENTS OPERATIONAL LIFE – OPERATION IN ORBIT, AIR, VACUUM AT 1G	ANALYSIS	PART OF EACH UNIT DESIGN SPEC
3.2.1	CONFIGURATION	TEST	MASS PROPERTIES
3.2.2	ORBIT	ANALYSIS	
3.2.3	SPATIAL COVERAGE	TEST	AC07
3.2.4	BAND-TO-BAND REGISTRATION	TEST	IA04R, BL19/20 TESTS
3.2.5	SQUARE WAVE RESPONSE	TEST	BL16/17
3.2.6	ALIGNMENT REFERENCE	ANALYSIS/TEST	ALIGNMENT CUBE
3.2.7	GEOMETRIC ACCURACY	TEST	BL19/20 TEST, SMA ACCEPTANCE
3.2.7.1	SCAN RATE	TEST	SMA UNIT LEVEL TEST, BL19/20
3.2.7.2	OVERLAP/UNDERLAP	ANALYSIS/TEST	BL19/20; SLC UNIT LEVEL TEST



F-1 SPEC REQUIREMENTS COMPLIANCE MATRIX

SPEC 400.8-D-210, REV B (cont.)

SBRC

SPEC PARAGRAPH	REQUIREMENT	VERIFICATION METHOD	COMMENTS
3.2.7.3	SCAN LINE LENGTH	TEST	SMA ACCEPTANCE TEST, SRT
3.2.8	SPECTRAL COVERAGE	ANALYSIS	COMPUTED FROM UNIT LEVEL DATA
3.2.8.1	SPECTRAL MATCHING	TEST	AC22
3.2.9	RADIOMETRIC REQUIREMENTS	N/A	
3.2.9.1	RADIOMETRIC SENSITIVITY	TEST	AC02R, BL12; SIGNAL DRIFT NOT TESTED, BAND 1-5 & 7
3.2.9.2	STEP RESPONSE	TEST	UNIT LEVEL – FPA'S
3.2.9.3	SCAN MODULATION	ANALYSIS/TEST	ANALYSIS USES UNIT LEVEL SMA AND SLC DATA
3.2.9.4	FULL SCALE INPUT	TEST	AC02R, BL10
3.2.9.5	GAIN RANGE	ANALYSIS	STUDY OF GAIN RANGE OPTIONS

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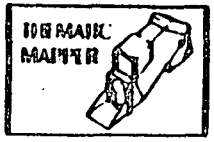


F-1 SPEC REQUIREMENTS COMPLIANCE MATRIX
SPEC 400.8-D-210, REV B (cont.)

SBRC

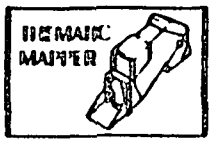
SPEC PARAGRAPH	REQUIREMENT	VERIFICATION METHOD	COMMENTS
3.2.9.6	SUPPRESSION OF STRAY RADIANCE	ANALYSIS	
3.2.9.7	DELETED		SOLAR RADIATION INPUT
3.2.9.8	RADIOMETRIC ACCURACY	ANALYSIS	
3.2.9.9	INTERNAL RADIOMETRIC CALIBRATION	DESIGN	
3.2.9.10	DELETED		SOLAR CALIBRATION
3.2.9.11	POLARIZATION SENSITIVITY	ANALYSIS	
3.2.9.12	BRIGHT TARGET RECOVERY	TEST	UNIT LEVEL ONE TIME ONLY
3.3	SUBSYSTEM REQUIREMENTS	N/A	
3.3.1	OPTICS: SCANNER	N/A	
3.3.1.1	ORBITAL REFOCUS	ANALYSIS	
3.3.1.2	TOLERANCE SENSITIVITY ANALYSIS	ANALYSIS	
3.3.1.3	OPTICAL ALIGNMENT	TEST	ALIGNMENT CUBE TO OPTICAL AXIS

F-1 SPEC REQUIREMENTS COMPLIANCE MATRIX

SPEC 400.8-D-210, REV B (cont.)

SBRC

SPEC PARAGRAPH	REQUIREMENT	VERIFICATION METHOD	COMMENTS
3.3.1.4	CONTAMINATION	INSPECT.	WITNESS MIRRORS
3.3.1.5	SCANNER	DESIGN	
3.3.2	DETECTORS	N/A	
3.3.2.1	BANDS 1 THRU 4	DESIGN	
3.3.2.2	BANDS 5 THRU 7	DESIGN	
3.3.3	RADIATIVE COOLER	DESIGN	
3.3.3.1	THERMAL	ANALYSIS/TEST	UNIT & SYSTEM LEVEL
3.3.3.2	MECHANICAL	ANALYSIS/TEST	UNIT LEVEL
3.3.3.3	DETECTOR MOUNTING TEMP	TEST	RAD COOLER UNIT LEVEL
3.3.3.4	ANTICONTAMINATION PROVISIONS	ANALYSIS/DESIGN	
3.3.3.5	BENCH TEST CAPABILITY	TEST	
3.3.4	ELECTRONICS	DESIGN/TEST	
3.3.4.1	SIGNAL PROCESSING	DESIGN/TEST	FREQ RESPONSE – TESTED AT UNIT LEVEL
3.3.4.2	COMMAND AND TELEMETRY		ADDRESSED IN ICD
3.3.4.2.1	COMMANDS	DESIGN	KEYED CONNECTORS ONLY
3.3.4.2.2	TELEMETRY	DESIGN/TEST	UNIT LEVEL

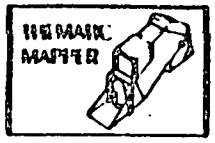


F-1 SPEC REQUIREMENTS COMPLIANCE MATRIX

SPEC 400.8-D-210, REV B (cont.)

SBRC

SPEC PARAGRAPH	REQUIREMENT	VERIFICATION METHOD	COMMENTS
3.3.4.2.3	TEST POINTS	DESIGN	SEPARATE CONNECTORS
3.3.4.3	POWER SUPPLY	TEST	
3.3.4.4	MULTIPLEXER	TEST	
3.3.4.4.1	FORMATTER	TEST	
3.3.4.4.2	OSCILLATOR	TEST	
3.3.4.4.3	POWER SUPPLY	TEST	
3.3.4.4.4	MULTIPLEXER TELEMETRY	TEST	
3.3.4.4.5	TIME CODE	TEST	
3.3.5	MISCELLANEOUS	N/A	
3.3.5.1	RADIATION ENVIRONMENT	ANALYSIS	
3.3.5.2	SINGLE POINT FAILURES	ANALYSIS	
3.3.5.3	MAINTAINABILITY	ANALYSIS	
3.3.5.4	TORQUE MARGIN	ANALYSIS	
3.3.5.5	MOISTURE AND FUNGUS RES	DESIGN	STANDARD MATERIAL REVIEW
3.3.5.6	MAGNETIC REQUIREMENTS	TEST	EM ONLY
3.3.5.7	FINISHES	ANALYSIS	
3.3.5.8	RADIOACTIVITY CONTROL	DESIGN	
3.3.5.9	IDENTIFICATION AND MARKING	INSPECTION	



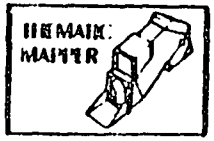
F-1 SPEC REQUIREMENTS COMPLIANCE MATRIX

SPEC 400.8-D-210, REV B (cont.)

SBRC

SPEC PARAGRAPH	REQUIREMENT	VERIFICATION METHOD	COMMENTS
3.3.5.10	CONNECTORS	DESIGN/INSPECTION	
3.3.5.11	CONNECTOR PIN DESIGNATIONS	N/A	
3.4	BENCH TEST AND CALIB. EQ.	N/A	
3.5	BENCH COOLER AND CONSOLE	N/A	

3.1.2 INTERFACE CONTROL DOCUMENT MATRIX



INTERFACE CONTROL DOCUMENT COMPLIANCE MATRIX

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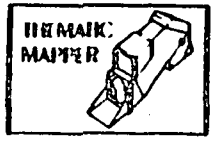
GSFC 400.8-D-201B	REQUIREMENT	VERIFICATION METHOD	COMMENTS
1.3.1	REQUIREMENTS - GENERAL COORDINATE SYSTEM DEF.	N/A	
3.0	ELECTRICAL INTERFACE REQUIREMENTS	N/A	
3.1	GROUNDING	N/A	
3.1.1	GENERAL (SINGLE PT. GROUNDING)	INSPECTION	
3.1.2	CHASSIS GROUND	TEST	IA07
3.1.3	SHIELD GROUNDS	DESIGN	
3.1.4	SIGNAL AND POWER RETURN	TEST	IA07
3.1.5	COMMAND RELAY RETURNS	DESIGN	
3.1.6	EMI FILTERS	DESIGN	
3.2	CONNECTORS	N/A	
3.2.1	GENERAL	INSPECTION	
3.2.2	DATA OUTPUTS	INSPECTION	
3.2.3	GROUND SUPPORT EQ. INTERFACES	INSPECTION	
3.2.4	POWER INPUT AND RETURN	INSPECTION	
3.2.5	CONNECTOR KEYING AND IDENTIFICATION	INSPECTION	
3.2.6	SPARE PINS	INSPECTION	



INTERFACE CONTROL DOCUMENT COMPLIANCE MATRIX (cont.)

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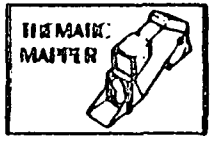
GSFC 400.8-D-201B	REQUIREMENT	VERIFICATION METHOD	COMMENTS
3.3	POWER	N/A	
3.3.1	GENERAL	N/A	
3.3.2	POWER SOURCE CHARACTERISTICS	N/A	
3.3.2.1	VOLTAGE	N/A	
3.3.2.2	POWER OUTPUT	N/A	
3.3.2.3	IMPEDANCE	N/A	
3.3.2.4	POWER SUPPLY TRANSIENTS	DESIGN	
3.3.2.5	POWER SUPPLY OUTPUT RIPPLE	DESIGN	
3.3.3	TM POWER REQUIREMENTS	TEST	IA07
3.3.3.1	TURNON TRANSIENTS	TEST	IA07
3.3.3.2	TURNOFF TRANSIENTS	DESIGN	
3.3.3.3	OPERATIONAL TRANSIENTS	DESIGN	HS 236-6995
3.3.3.4	REFLECTED RIPPLE CURRENT	DESIGN	
3.3.3.5	CURRENT LIMITING	DESIGN	
3.3.3.6	POWER PROFILES	DESIGN/TEST	IA07
3.3.3.7	INTERFACES	DESIGN/TEST	IA07
3.4	COMMANDS	DESIGN/TEST	IA07

INTERFACE CONTROL DOCUMENT COMPLIANCE MATRIX (cont.)

SBRC

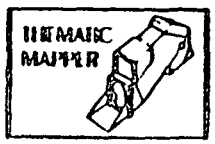
GSFC 400.8-D-201B	REQUIREMENT	VERIFICATION METHOD	COMMENTS
3.4.1	DISCRETE COMMANDS	DESIGN/TEST	IA07
3.4.1.1	SWITCH CLOSURE	DESIGN/TEST	IA07
3.4.1.2	+28V PULSE	DESIGN/TEST	IA07
3.4.1.3	DISCRETE COMMAND TIMING	DESIGN/TEST	IA07
3.4.2	SERIAL DIGITAL COMMANDS	DESIGN/TEST	IA07
3.5	TELEMETRY	DESIGN/TEST	IA07
3.5.1	REMOTE INTERFACE UNIT TELEMETRY INTERFACE	DESIGN/TEST	
3.5.2	TELEMETRY POINTS	DESIGN/TEST	
3.6	TM MUX SIGNAL INTERFACE	DESIGN/TEST	UNIT LEVEL MUX ACCEPTANCE TEST
3.6.1	FORMAT	DESIGN/TEST	UNIT LEVEL MUX ACCEPTANCE TEST
3.6.2	MUX HOUSKEEPING TELEMETRY	DESIGN/TEST	
3.7	ELECTROMAGNETIC INTERFACE	N/A	
3.7.1	SPACECRAFT GEN MAGNETIC FIELDS	TEST	TEST AT GSFC
3.7.2	DELETED		
3.7.3	MAGNETIC MATERIALS	DESIGN/TEST	



INTERFACE CONTROL DOCUMENT COMPLIANCE MATRIX (cont.)

SBRC

GSFC 400.8-D-201B	REQUIREMENT	VERIFICATION METHOD	COMMENTS
3.7.4	EMI/EMC REQUIREMENTS	TEST	
4.0	MECHANICAL INTERFACE REQ	N/A	
4.1	INTERFACE CONTROL DWGS	INSPECTION	
4.2	DIMENSIONAL LIMITS	INSPECTION	
4.4	TM INTEGRATION	INSPECTION	
4.5	MOUNTING INTERFACE	N/A	
4.6	ADS MOUNT	INSPECTION	
4.7	ALIGNMENT	TEST	ALIGNMENT CUBE TEST
4.8	MECHANISMS	N/A	
4.8.1	DYNAMIC DISTURBANCES	ANALYSIS	
4.8.2	CAGING	TEST	UNIT LEVEL AND THERMAL VACUUM (COOLER DOOR)
4.8.3	APERTURE COVER PLATES	INSPECTION	
4.9	ACCESSIBILITY	INSPECTION	
5.0	THERMAL INTERFACE REQ	N/A	
5.1	THERMAL ENVIRONMENT	TEST	THERMAL BALANCE
5.2	HEAT DISSIPATION	TEST	THERMAL BALANCE



INTERFACE CONTROL DOCUMENT COMPLIANCE MATRIX (cont.)

SBRC

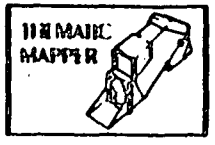
GSFC 400.8-D-201B	REQUIREMENT	VERIFICATION METHOD	COMMENTS
6.0	ATTITUDE CONTROL INTERFACE	N/A	
6.1	WEIGHT AND CG	TEST/ANALYSIS	CG MEASURED - TWO-AXIS, 3RD COMPUTED
6.2	MOMENTS OF INERTIA	TEST/ANALYSIS	
6.3	ANGULAR MOMENTUM AND TORQUE	ANALYSIS	
7.0	OTHER INTERFACE REQUIREMENTS	DESIGN	
7.1	COMMAND RESTRICTIONS CONSTRAINTS	INSPECTION	O&M MANUAL
7.2	TEMPERATURE	INSPECTION	O&M MANUAL
7.3	PRESSURE	INSPECTION/TEST	
7.4	VIBRATION	TEST	
7.5	ACOUSTICS	TEST	SEE TEST PLAN
7.6	DELETED		
7.7	ACCELERATION	ANALYSIS	
7.8	SPACE BACKGROUND SIMULATION	TEST	
7.9	CONTAMINATION CONTROL	N/A	
7.9.1	ACTIVITIES	INSPECTION	
7.9.2	LAUNCH AND RECOVERY	ANALYSIS/TEST	

3.2 SYSTEM PERFORMANCE REVIEW

Charts that describe the system performance in summary fashion are included as an addendum to this report entitled "Flight Model Pre-shipment Review" 23 September 1982.

3.3 TEST PLANS AND TEST DESCIPTIONS

The following series of charts show the test plan used for system test performance of the Flight Model Thematic Mapper, and a description of the major tests. Test results are summarized in Vol. III of this report.



FLIGHT MODEL TEST PLAN

SBRC

TEST NUMBER	TEST NAME
IA01	PRIME FOCAL PLANE COARSE AND FINE FOCUS
IA06	SCAN MIRROR TO RADIOMETER ALIGNMENT
IA03	COOLED FOCAL PLANE COARSE FOCUS
IA04	COOLED FOCAL PLANE FINE FOCUS & BAND-TO-BAND REGISTRATION
AC07	SPATIAL COVERAGE
IA07	ELECTRONICS MODULE INTEGRATION
AC02	GAIN SETTING, RADIOMETRIC CALIB, & OBC CALIB; BANDS 1-5 & 7
AC22	SPECTRAL MATCHING
BL07	RADIOMETRIC CALIBRATION OF TM CALIBRATOR & SPECTRAL MATCHING
BL16	SQUARE WAVE RESPONSE BANDS 1-5 & 7
BL17	SQUARE WAVE RESPONSE BAND 6
BL10	RADIOMETRIC CALIBRATION BAND 6
BL12	COHERENT NOISE
BL 19/20	GEOMETRIC ACCURACY/BAND-TO-BAND REGISTRATION
MASS PROPERTIES	MASS PROPERTIES (WEIGHT, CG, MOMENTS OF INERTIA)
SINE VIBRATION	SINE VIBRATION TESTING - QUALIFICATION
ACOUSTIC NOISE	ACOUSTIC NOISE TESTING - QUALIFICATION
THERMAL VACUUM	VACUUM PERFORMANCE TESTING

21170-12
9/82

IA01 TEST DESCRIPTION

SBRC
A SUBSIDIARY OF
HUGHES AIRCRAFT COMPANY

OBJECTIVES

- BANDS 1 THROUGH 4, COARSE FOCUS, FINE FOCUS, INTERCONNECT VERIFICATION, AND VIGNETTING.

TEST FLOW

- USING KINETIC KNIFE EDGE TECHNIQUE FOR MEASURING MTF, CONDUCT MTF SURVEY OF IMAGE FROM -0.030 IN. TO +0.030 IN. FOCUS IN ALONG-TRACK AND CROSSTRACK DIRECTION OF COMBINED SCAN MIRROR AND TELESCOPE ASSEMBLY.
- SELECT BEST FOCUS FROM MTF DATA, INSTALL CORRECT SHIM AND VERIFY FOCUS BY REPEATING SURVEY
- USING IFOV INTERCONNECT MASK, SELECTIVELY UNCOVER DETECTORS AND MONITOR CHANNEL OUTPUT

DATA OUTPUT

- MTF PLOTS, FOCUS-VS-PEAK MTF, MANUAL PLOTS OF BAFFLE CLEARANCE

RESULTS

- SHIM AND FPA LOCATION ACCEPTABLE
- MTF (CT) RANGE FROM 0.45 TO 0.55, (AT) 0.42 TO 0.54
- NO SIGNIFICANT TILT TO THE PFPA

IA03R TEST DESCRIPTION

SBRC

OBJECTIVE

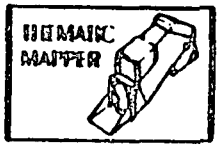
DETERMINE IMAGE QUALITY AT COLD FOCAL PLANE, AND DETERMINE BEST SHIM THICKNESS FOR OPTIMUM FOCUS

TEST FLOW

WITH TM LOOKING AT COLLIMATOR, CONDUCT AXIAL MTF SURVEY BY STEPPING KINETIC KNIFE EDGE FROM – 0.60 TO -0.25 IN. IN Z DIRECTION. PLOT MTF PEAK AS FUNCTION OF Z MOTION FOR ALONG AND CROSSTRACK. FROM PLOTS DETERMINE OPTIMUM SHIM THICKNESS. AS IN IA01, MANUALLY SURVEY AFT OPTICS BAFFLES, LOCATE CENTERS

DATA OUTPUT

MTF PLOTS AS FUNCTION OF AXIAL DISPLACEMENT, SHIM THICKNESS, LIMITING RAY CLEARANCE WITH BAFFLES



IA04 TEST DESCRIPTION

SBRC
A SUBSIDIARY OF
HUGHES AIRCRAFT COMPANY

TEST OBJECTIVE

ESTABLISH FINE FOCUS OF CFPA, ROTATIONALLY ALIGN CFPA TO PFPA, TRANSLATE CFPA TO PROVIDE BAND-TO-BAND REGISTRATION WITH PFPA

TEST FLOW

CONDUCT AXIAL MTF SURVEY OF IMAGE PLANE, MOVE RELAY SPHERICAL MIRROR BY USING INCHWORMS TO CORRECT FOCUS. USING IA RETICLE AND KNIFE EDGE RESPONSES, COMPUTE ROTATION OF CFPA RELATIVE TO PFPA (< 5MR). ADJUST CFPA WITH TOOL. USING IA RETICLE AND INCHWORMS TRANSLATE CFPA FOR BEST BBR FIT TO PFPA. PERFORM CFPA INTERCONNECT VERIFICATION (SIMILAR TO TEST PERFORMED IN IA01).

DATA OUTPUT

MTF AS FUNCTION OF AXIAL DISPLACEMENT, DETECTOR REGISTRATION TO PFPA

RESULTS

BAND-TO-BAND REGISTRATION IS WITHIN SPECIFICATION

IA06 TEST DESCRIPTION

SBRC
A SUBSIDIARY OF
HUGHES AIRCRAFT COMPANY

OBJECTIVE

VERIFY ROTATIONAL ALIGNMENT OF TELESCOPE HOUSING IN MAINFRAME SUCH THAT SCAN MIRROR PIVOT AXIS IS ORTHOGONAL TO DETECTOR ALONG-SCAN BASELINE. REESTABLISH BASELINE MTF VALUES IF HOUSING IS ROTATED. VERIFY CENTRATION OF SCAN MIRROR.

TEST FLOW

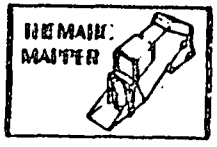
ROTATIONALLY ALIGN EDGE OF COLLIMATOR MOUNTED RETICLE TO BE PARALLEL TO Y-AXIS. ROTATE TM TO ALIGN SMA PIVOT AXIS ORTHOGONAL TO RETICLE EDGE BY MONITORING DETECTOR MODULATION IN BANDS 1 AND 4. ROTATE HOUSING AS NEEDED TO GET ZERO OUTPUT. TEST SLC ALIGNMENT, BASELINE MTF FOLLOWING ROTATION.

DATA OUTPUT

RELATIVE ROTATIONAL ALIGNMENTS OF SMA PIVOT AXIS, SLC PIVOT AXIS, DETECTOR ARRAY. BASELINE MTF VALUES ARE ESTABLISHED.

RESULTS

SHIM DETERMINED IN IA01 FOUND TO BE APPROPRIATE. SMA TO PFPA ALIGNMENT ERROR = -0.02 MR. SPEC = 10.5 MRL. SCAN MIRROR CENTRATION WITHIN TOLERANCES.



IA07 TEST SUMMARY

SBRC
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HUGHES AIRCRAFT COMPANY

OBJECTIVE

CHECK ELECTRONICS MODULE INTEGRATION, POWER, COMMANDS, TELEMETRY, REDUNDANCY, SYSTEM TIMING, VIDEO CHANNEL NOISE, VERIFY INTERCONNECTION

TEST FLOW

PERFORM PRELIMINARY WIRING, POWER AND GROUND CHECK; VERIFY TELEMETRY SCALING, CHECK FIVE HEATERS. CHECK BLACKBODY, SMA CONTROL, DC RESTORE, FUSIBLE LINK DRIVE, COOLER DOOR, INCHWORM DRIVE. AUTOMATICALLY SEQUENCE CALIBRATION LAMPS THROUGH 8 RADIANCE STEPS, VERIFY CALIBRATION SHUTTER CONTROL. CONDUCT SLC TEST, VERIFY BAND TELEMETRY, CONDUCT POWER PROFILE, CONDUCT IFOV INTERCONNECT THROUGH MULTIPLEXER OUTPUT.

DATA OUTPUT

TABULAR VERIFICATION OF COMMANDS, TELEMETRY, ETC.

RESULTS

ELECTRONICS MODULE INTEGRATION SUCCESSFULLY COMPLETED.

AC02R TEST DESCRIPTION

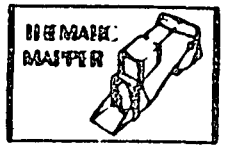
SBRC

OBJECTIVES

- CALCULATE GAIN TRIM RESISTORS FOR EACH BAND
- MEASURE END TO END RADIOMETRIC TRANSFER FUNCTION TO BETTER THAN 10% FULL SCALE
- MEASURE RELATIVE TRANSFER FUNCTION, DETECTOR-TO-DETECTOR WITHIN 1/4% RMS NOISE
- MEASURES RELATIVE RADIOMETRIC ACCURACY BETWEEN BANDS WITHIN 2%
- CALIBRATE INTERNAL CALIBRATOR
- DETERMINE GAIN AND OFFSET, S/N OF EACH CHANNEL

TEST FLOW

- ALIGN TM APERTURE WITH 48 IN. SPHERICAL INTEGRATING SOURCE (SIS)
- RECORD ZERO RADIANCE LEVEL, MAX RADIANCE LEVEL IN EACH BAND
- CALCULATE TRIM RESISTORS, INSTALL NEW RESISTORS IN TM REPEAT TEST
- TURN ON 48 IN. SIS TO HIGHEST LEVEL, DECREMENT RADIANCE 20 STEPS - RECORD DATA (95K CFPA)
- CHANGE CFPA TEMPERATURE TO 105K. REPEAT 20 RADIANCE STEPS
- TURN ON INTERNAL CALIBRATOR, DECREMENT 8 RADIANCE LEVELS, RECORD DATA OUTPUT
- COMPUTE GAINS, OFFSETS, S/N



AC22R TEST DESCRIPTION

SBRC
A SUBSIDIARY OF
HUGHES AIRCRAFT COMPANY

OBJECTIVE

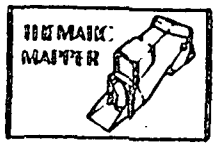
VERIFY THAT ALL DETECTORS IN EACH BAND 1-5 AND 7 HAVE THE SAME SPECTRAL RESPONSE

SPECIFICATION REQUIREMENT

FOR SCENES OF BOTH "FLAT" AND "SLOPED" SPECTRAL RADIANCE, THE DIFFERENCE BETWEEN BAND MAX AND MIN VALUES OF EFFECTIVE RADIANCE COMPUTED FROM MEASURED TM RESPONSE MUST BE $\leq 0.5\%$ OF THE SPECIFIED MINIMUM SATURATION LEVEL RADIANCE (MSL)

TEST IMPLEMENTATION

1. 48 INCH SPHERICAL INTEGRATING SOURCE (SIS) USED TO PRODUCE A SCENE OF "FLAT" SPECTRAL RADIANCE
2. COLLIMATOR NO. 3 SIS AND APPROPRIATE COLOR GLASS FILTERS USED TO PRODUCE A SCENE OF "SLOPED" SPECTRAL RADIANCE
3. DATA COLLECTED FROM EACH SCENE, EFFECTIVE RADIANCE COMPUTED, AND VALUES IN EACH BAND SUBJECTED TO SPECIFICATION REQUIREMENT



AC-07R TEST DESCRIPTION

SBRC
A SUBSIDIARY OF
HUGHES AIRCRAFT COMPANY

OBJECTIVES

DETERMINE INSTANTANTANEOUS FIELD OF VIEW (IFOV) OF REPRESENTATIVE DETECTORS IN EACH BAND BY MAPPING RESPONSE OUT TO ± 2 IFOVS

TEST FLOW

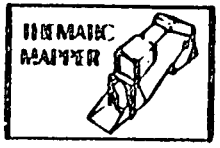
USING 109.3 IN. FOCAL LENGTH COLLIMATOR AND TM WITH LOCKED SCAN MIRROR, START AT BAND 4 AND FOR EACH DETECTOR SCAN WIDE SLIT FROM -12.25 IFOV TO -2.25 IFOV. SCAN NARROW (0.1 IFOV) FROM -3.75 TO +3.75 IFOV IN 20 STEPS. CONTINUE SCAN OF WIDE SLIT FROM 2.25 IFOV TO +12.25 IFOV. ROTATE SLIT PATTERN 90°, SCAN VERTICALLY IN LIKE FASHION. AT EACH POSITION COLLECT DATA. FIND PEAK SIGNAL IN X, Y SCANS. NORMALIZE DATA, COMPUTE 50% RESPONSE POINTS, FIND BOUNDARIES OF IFOV.

DATA OUTPUT

DETECTOR SIZE, LOCATION, PRINTED IFOV DATA CONVERTED TO RADIAN MEASURE RELATIVE TO OPTICAL AXIS, PLOTTED

RESULTS

TEST DATA INDICATES IFOV SIZE OF BAND 1-5 AND 7 DETECTORS IS SLIGHTLY LARGER THAN SPECIFICATION ALLOWS.



BL-07R TEST DESCRIPTION

SBRC
A SUBSIDIARY OF
HUGHES AIRCRAFT COMPANY

OBJECTIVES

TRANSFERS CALIBRATION OF 48 IN. INTEGRATING SPHERE TO THE TM CALIBRATOR USING THEMATIC MAPPER AS CALIBRATION TRANSFER DEVICE.

TEST FLOW

COLLECT DATA FROM MTF SIS AT EACH OF 8 RADIANCE LEVELS ESTABLISHED BY NEUTRAL DENSITY FILTER WHEEL. REPEAT FOR 3 FPA TEMPERATURES 1°C APART. COLLECT OPAQUE AND CLEAR DATA. REPEAT ENTIRE SEQUENCE WITH STABLE AMBIENT FPA TEMPERATURE. USING AC02 GAINS AND OFFSETS, COMPUTE EFFECTIVE RADIANCE OF EACH RADIANCE LEVEL. DETERMINE SHADING FACTORS.

DATA OUTPUT

EFFECTIVE RADIANCE AT 8 DIFFERENT LEVELS 2 DIFFERENT FPA TEMPERATURES; SHADING FACTORS; OBC CALIBRATION DATA

RESULTS

CALIBRATION TRANSFERRED FROM 48 IN. INTEGRATING SPHERE TO THE CALIBRATOR.

BL1OR TEST DESCRIPTION

SBRC

OBJECTIVE

- MEASURES END-TO-END TRANSFER FUNCTION OF EACH BAND 6 CHANNEL TO AN ABSOLUTE ACCURACY BETTER THAN 10%
- MEASURES RELATIVE TRANSFER FUNCTION < 1/4% OF RMS NOISE LEVEL
- ESTABLISHES GAINS AND OFFSETS; CALIBRATES INTERNAL CALIBRATOR, AND MEASURES SIGNAL DRIFT

TEST FLOW

- THERMALLY CONDITION SENSOR BY CONDUCTING THREE OPERATIONAL PROFILES (100 MINUTE ORBIT) AT 10% DUTY CYCLE; COLLECT SIGNAL DRIFT DATA, AND CONDUCT TWO MORE OPERATIONAL PROFILES
- COLLECT DATA WITH BLACKBODY AT FIVE TEMP AND COLD FOCAL PLANE AT THREE TEMP TO ESTABLISH GAIN, LINEARITY
- CONDITION SENSOR WITH THREE MORE OPERATIONAL PROFILES, AND COLLECT SECOND SIGNAL DRIFT DATA
- COLLECT SLC PROFILE DATA (ON VS OFF)
- FINISH 24 HR SIGNAL DRIFT TIME WITH 30% DUTY CYCLE OPERATIONAL PROFILES
- COLLECT LAST SIGNAL DRIFT DATA

DATA OUTPUT

- SLC TEMP PROFILE, OPERATIONAL PROFILES, GAIN LINEARITY OUTPUTS, SIGNAL DRIFT, NETD FOR EACH DETECTOR, AND SHADING FACTORS

BL-12 TEST DESCRIPTION

SBRC
A SUBSIDIARY OF
HUGHES AIRCRAFT COMPANY

OBJECTIVE

- EVALUATE THEMATIC MAPPER COHERENT NOISE SIGNATURE OVER LOWER 64 PCM LEVELS FOR BANDS 1 TO 5 AND 7
- EVALUATE BAND 6 AT FOUR DISCRETE PCM LEVELS
- PROVIDE VISUAL DISPLAY OUTPUT AND POWER SPECTRAL DENSITY VALUES

TEST FLOW

- ALIGN CALIBRATOR TO THEMATIC MAPPER, TURN ON FLOOD LAMP, COLLECT DATA
- REMOVE FLOOD LAMP; TURN ON BLACKBODY; SET AT LOWEST TEMP; COLLECT DATA
- ADJUST TEMP TO FOUR DIFFERENT LEVELS; COLLECT DATA
- TURN OFF CALIBRATOR, THEMATIC MAPPER
- SELECT DATA REDUCTION OPTION. IF PHOTOGRAPHIC OUTPUT IS DESIRED, OUTPUT DATA TO LASER PHOTOWRITER. IF PSD IS DESIRED, PRETREAT DATA BY WEIGHTING, ADJUST ARRAY SIZE, CALCULATE FAST FOURIER TRANSFORM, CALCULATE PSD, SMOOTH OUTPUT, AND PLOT

DATA OUTPUT

- PHOTO IMAGES OF RADIANCE GRADIENT, PSD PLOTS

RESULTS

- DATA COLLECTED
- VISUAL IMAGES OBTAINED FROM COMTAL RECORDER

BL 16/17R TEST DESCRIPTION

SBRC

OBJECTIVES

MEASURE DYNAMIC SQUARE WAVE RESPONSE OF TM

TEST FLOW

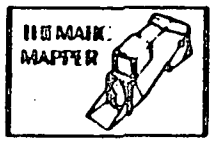
FOR BANDS 1 TO 5 AND7, CALIBRATOR PHASED KNIFE EDGE RETICLE SCANS ACROSS TM DETECTORS BY SMA. RESULTING DATA STREAM IS SORTED AND CONVERTED TO KNIFE EDGE RESPONSE CURVE. SPATIAL FREQUENCY BAR PATTERNS ARE ANALYTICALLY SUPERIMPOSED ON THE KNIFE EDGE RESPONSE CURVE AND SHIFTED IN 0.1 IFOV INCREMENTS. MAX AND MIN VALUES OVER ONE BAR CYCLE ARE NOTED. THEN

$$SWR = \frac{MAX-MIN}{MAX+MIN}$$

BAND 6 PROCESSED IDENTICALLY, EXCEPT THAT RETICLE SHIFTED 0.1 IFOV AFTER FIRST DATA SET TO PROVIDE MORE DATA POINTS OVER LARGER IFOV

DATA OUTPUT

SQUARE WAVE RESPONSE FOR ALL BANDS



BL19/20 TEST DESCRIPTION

SBRC

OBJECTIVE

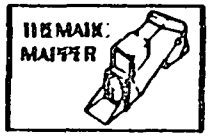
- PROVIDE SELF INDUCED VIBRATION FREQUENCY AND AMPLITUDE INFORMATION
- DETERMINE BAND-TO-BAND REGISTRATION, GEOMETRIC ACCURACY (SCAN PROFILE)

TEST FLOW

- USING BBR/GA RETICLE (73118) IN CALIBRATOR, COLLECT DATA AT EACH OF 31 CALIBRATOR ROTARY TABLE POSITIONS
- USING POSITION CODING DERIVED FROM RETICLE, ANALYTICALLY ASSEMBLE RETICLE PATTERNS IN SEQUENCE ACROSS FULL SCAN
- DETERMINE CROSS SCAN SIGNAL CALIBRATION USING RETICLE 72717
- USING INFORMATION FROM BOTH RETICLES TRACE PATH OF INDIVIDUAL DETECTORS ACROSS 31 RETICLE PATTERNS
- DETERMINE SCAN PROFILE POLYNOMIAL COEFFICIENTS
- DETERMINE GEOMETRIC ACCURACY, BBR
- EXAMINE FREQUENCY CONTENT FOR SIV
- NOTE EFFECT OF SLC ON VS OFF

DATA OUTPUT

SCAN LINEARITY, SIV FREQUENCYS,SLC PROFILE, SCAN PROFILE, BAND-TO-BAND REGISTRATION.



SYSTEM READINESS TEST (SRT)

SBRC

OBJECTIVE

- TO DETERMINE OVERALL SYSTEMS READINESS OF THE THERMATIC MAPPER
- TEST WILL BE IMPLEMENTED AT ANY TIME DURING THE TEST PROGRAM TO VERIFY THAT NO GROSS MALFUNCTIONS HAVE OCCURRED.

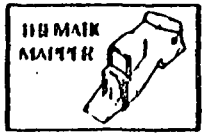
TEST FLOW

- FUNCTIONAL OPERABILITY
  - USES COMMAND FILE TO AUTOMATICALLY COMMAND SYSTEM TO VERIFY RESPONSE THROUGH TELEMETRY
  - PERFORMED IN PRIMARY AND REDUNDANT MODES.
- RADIOMETRIC PERFORMANCE
  - MONITORS RADIOMETRIC PERFORMANCE AND LONG TERM STABILITY, WITH 4 OPTIONS
    - BAND 1 - 4, 5 & 7 USING INTERNAL CALIBRATION LAMPS
    - BAND 1 - 4, 5 & 7 USING EXTERNAL TM CALIBRATOR SPHERICAL INTEGRATOR SOURCE
    - BAND 6 USING INTERNAL BLACKBODY
    - BAND 6 USING EXTERNAL TM CALIBRATOR BLACKBODY
- SCAN MIRROR ASSEMBLY LINE LENGTH
  - USED TO VERIFY STABILITY OF SCAN PROFILE
  - DATA COLLECTED FOR 100 SCANS
  - SCAN MIRROR ELECTRONICS CHECKED CONCURRENTLY

Section 4.1

Failure Report Summary

A listing of failure reports generated on the Flight Model Thematic Mapper showing symptoms, cause of failure, and corrective action is included in Volume III.



SUMMARY OF FAILURE REPORTS

SBRC

Category	EM		PF		FL		TOTALS
	OPEN	CLOSED	OPEN	CLOSED	OPEN	CLOSED	
Under Investigation	0	0	0	0	17	0	17
Workmanship	0	14	0	99	0	82	195
Part Failure	0	10	0	48	0	13	70
Drawing/Design Error	0	32	0	93	0	24	149
Specification/Software Problem	0	3	0	21	0	6	30
Opened in error	0	2	0	3	0	8	13
Test error	0	15	0	51	1	40	106
Mechanical Failure	0	9	0	0	0	2	11
Test Equipment	0	1	0	8	0	20	28
Unknown	0	2	0	0	0	16	18
TOTALS:	0	88	0	323	18	210	637

TOTAL FAILURE REPORTS PER MODEL TO DATE:

EM	PF	FL
88	323	228

TOTAL = 637 of which one (1) was generated against all three model levels.

Section 4.2

Request for Deviation/Waiver Summary

A listing of Requests for Deviations/Waivers generated against the Flight Model Thematic Mapper, showing R/D/W number, description and status is included in Volume III.

DEFINITIONS FOR DEVIATION/WAIVER CATAGORIES

SBRC

DRAWING CHANGES

THOSE ITEMS REQUIRING CHANGES TO THE DRAWINGS TO CORRECT DEFICIENCIES RESULTING FROM ARTWORK LAYOUT OF PWB; GENERALLY REQUIRING JUMPER WIRES OR ALTERNATE WIRING PROCEDURES

HARDWARE

THOSE ITEMS NOT MEETING PERFORMANCE, INTERCHANGEABILITY, WEIGHT, OR OTHER PHYSICAL OBJECTIVES OF CONTRACT

PROCEDURAL

THOSE ITEMS REQUIRING CHANGES TO THE SPECIFICATION REQUIREMENTS, WHICH ALLOW USING MODELS ON OTHER THAN THAT DESIGNATED FOR THE HARDWARE, WHICH RELAX OR WAIVE INSPECTION/WORKMANSHIP STANDARDS, AND OTHER DOCUMENTATION/HARDWARE RELATED ITEMS.

THEMATIC MAPPER PROGRAM
SUMMARY OF DEVIATIONS

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HUGHES AIRCRAFT COMPANY

221 DEVIATIONS WERE INITIATED FOR THEMATIC MAPPER PROGRAM FROM INCEPTION TO JULY 31, 1982.

DEVIATIONS INITIATED BY MODEL LEVEL

EM	PF	FL	TEST EQUIPMENT	LIFE TEST
9	89	113	12	0

NOTE: 61 DEVIATIONS WERE WRITTEN AGAINST MORE THAN ONE MODEL LEVEL.

THEMATIC MAPPER PROGRAM
SUMMARY OF WAIVERS BY GENERIC CATEGORY

SBRC

	EM	PF	FL	TEST EQUIPMENT	LIFE TEST
DRAWING	0	14	2	0	1
HARDWARE	10	41	59	4	3
PROCEDURAL	6	35	43	12	1

NOTE: 38 WAIVERS APPLIED TO HARDWARE AS WELL AS PROCEDURE

9/82
21170-38

THEMATIC MAPPER PROGRAM
SUMMARY OF DEVIATIONS OF GENERIC CATEGORY

SBRC

	EM	PF	FL	TEST EQUIPMENT	LIFE TEST
DRAWING	7	47	46	1	0
HARDWARE	0	28	38	1	0
PROCEDURE	2	27	51	8	0

NOTE: 19 DEVIATIONS APPLIED TO HARDWARE AS WELL AS PROCEDURE

22 DEVIATIONS APPLIED TO DRAWING CHANGES AS WELL AS HARDWARE

4 DEVIATIONS APPLIED TO DRAWING CHANGES, AS WELL AS PROCEDURE

9/82
21170-30

THEMATIC MAPPER PROGRAM
SUMMARY OF WAIVERS

SBRC

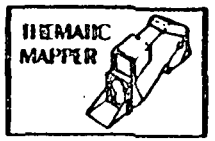
190 WAIVERS WERE INITIATED FOR THEMATIC MAPPER PROGRAM FROM INCEPTION TO JULY 30, 1982.

WAIVERS INITIATED BY MODEL LEVEL

EM	PF	FL	TEST EQUIPMENT	LIFE TEST
14	75	83	13	5

NOTE: 27 WAIVERS WRITTEN AGAINST MORE THAN ONE MODEL

Section 5.0
Handling, Packaging, and Transportation Plans



MOVING, HANDLING, AND TRANSPORTATION PROCEDURE

SBRC

MOVING REQUIREMENTS AND PROCEDURES; EQUIPMENT REQUIREMENTS; GENERAL MOVING PRECAUTIONS AND PROCEDURES; SPECIFIC MOVING PRECAUTIONS AND PROCEDURES:

- WITHIN A CLASS 10,000 CLEAN AREA
- FROM ONE CLASS 10,300 CLEAN AREA TO ANOTHER (SAME FACILITY)
- FROM ONE FACILITY TO ANOTHER
  - OVERLAND SHIPMENT
  - AIR SHIPMENT

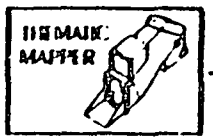
HANDLING REQUIREMENTS AND PROCEDURES; EQUIPMENT REQUIREMENTS; HANDLING PRECAUTIONS AND PROCEDURES:

- QUALIFIED PERSONNEL
- USE OF HYDROSET

PROCEDURE FOR LIFTING INSTRUMENT

TRANSPORTATION REQUIREMENTS AND PROCEDURES; EQUIPMENT REQUIREMENTS; TRANSPORT EQUIPMENT:

- OVERLAND ROUTES
- AIR SHIPMENT



MOVING, HANDLING, AND TRANSPORTATION PROCEDURES (con't)

SBRC

SHIPPING PREPRATION:

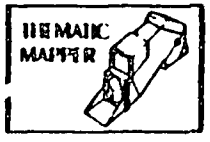
- ❽ SHIPPING CONTAINER PREPARATION
- ❾ INSTRUMENT PACKAGING
  - ❿ OVERLAND SHIPMENT
  - ⓫ AIR SHIPMENT

LOADING AND UNLOADING PROCEDURES:

- ⓬ GENERAL INSTRUCTIONS
- ⓭ RESPONSIBLE PERSONNEL
- ⓮ SECURING SHIPPING CONTAINER TO TRANSPORT VEHICLE

TRANSPORTATION PRECAUTIONS:

- ⓯ COMPANION CAR (SBRC OR HAC) FOR OVERLAND ROUTES
- ⓰ QUALITY ASSURANCE TO INSPECT SECURING OF SHIPPING CONTAINER IN CARGO BAY (AIR SHIPMENT)



MOVING, HANDLING, AND TRANSPORTATION PROCEDURE (con't)

SBRC

STORAGE PROCEDURES:

- CLASS 10,000 CLEAN ENVIRONMENT
- CLASS 100,000 OR HIGHER
- TEST EQUIPMENT

TRIP COORDINATION PROCEDURES:

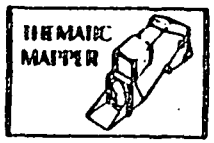
- RESPONSIBLE ENGINEERING ACTIVITY (REA)
- SHIPPING DOCUMENTATION REQUEST FOR SHIPMENT FORM 052-REV 3-72
  - DD 1149 - EQUIPMENT ON LOAN
  - DD 250 - FINAL SHIPMENT

CONTAMINATION CONTROL:

- SBRC SPEC 16309 PROCEDURE FOR HANDLING GRAPHITE EPOXY
- TP 32015-605 T.M. CLEANLINESS PLAN
- HS236-5827-1 HUMIDITY CONTROL PLAN

QUALITY ASSURANCE PROVISIONS:

- RESPONSIBILITIES OF QUALITY ASSURANCE PERSONNEL AT:
  - SBRC
  - HAC
  - GSFC
  - REMOTE ACOUSTIC FACILITY



MOVING, HANDLING, AND TRANSPORTATION PROCEDURE (con't)

SBRC

APPLICABLE DOCUMENTS FOR THEMATIC MAPPER INSTRUMENT, FOR MOVING, HANDLING, STORAGE AND TRANSPORTATION

TP32015-605	TM CLEANLINESS PLAN
HS236-5827-1	TM SYSTEM INTEGRATION AND TEST, HUMIDITY CONTROL PLAN
16357	SBRC MECHANICAL ASSEMBLY SPECIFICATION
16309	PROCEDURE FOR HANDLING THE GRAPHITE EPOXY COMPONENTS OF THE TM TO CONTROL EXPOSURE TO RELATIVE HUMIDITY
HP10-22	CONTROLLED AREA REQUIREMENTS
MIL-D-3464B	DESICCANTS, ACTIVATED, BAGGED, PACKAGING, USE AND STATIC DEHUMIDIFICATION

MODEL EFFECTIVITY	REVISIONS				
	SYM	DESCRIPTION	DATE	APPROVED	
ECS S/N002 & SUBQ	A	[illegible]	82-4-23		
51065 S/N003 & SUBQ	B	Revised as requested by ECR TP019/01	82-07-27		

CONTRACT NO.		SANTA BARBARA RESEARCH CENTER A Subsidiary of Hughes Aircraft Company GOLETA, CALIFORNIA		
PREPARED		TITLE THEMATIC MAPPER MOVING AND TRANSPORTATION PROCEDURE		
CHECKED				
APPROVED W.R. ADAMS	9-23-81			
APPROVED W.H. FREUDENSTEIN	9-24-81			
		SIZE A	CODE IDENT NO. 11323	NUMBER TP32015-608
		SCALE		SHEET 1 OF [illegible]

TABLE OF CONTENTS

1 0 SCOPE

This document establishes the procedure for the handling, moving and transporting of each of the three Thematic Mapper (TM) Instruments (Engineering, Protoflight and Flight Models), and the TM Calibrators, along with their associated test equipment between and at Santa Barbara Research Center (SBRC), Goleta, California; Hughes Aircraft Company (HAC), El Segundo, California; Goddard Space Flight Center (GSFC), Magnetic Facility, Greenbelt, Maryland; General Electric Company (GE), Valley Forge, Pennsylvania, Thompson-Ramo-Wooldridge (TRW), Acoustic Facility, Redondo Beach, California, or an equivalent remote acoustic facility; and for preparation for delivery.

The list of items to be transported (to include fixtures, cables, etc.) for each of the specific tests (EMI, Mass Properties, Vibration, Thermal Vacuum, Magnetic and Acoustic) should be taken from the applicable procedure that describes the test requirements and the equipment to be used.

Contamination control is included in this document to stress cleanliness of the TM equipment at all times, whether in test, storage or during transit.

Quality Assurance provisions are also included for compliance with the enclosed procedures to ensure the highest standards for the TM Instruments and TM Calibrators.

References to a Class 10,000 clean area, as a minimum: Refer to one as specified in Paragraph 4.0 of TP32015-609 (TM Cleanliness Test Plan), i.e., a Grade C (75 +/-10 deg F) at a Level 3 (65% maximum relative humidity). SBRC will maintain the Clean Room temperature at 70 (+/- 5 deg F) with relative humidity at 40% (maximum); At HAC/SSL facilities, SBRC will purge TM unit during non testing periods and when relative humidity goes beyond 65%. HAC (El Segundo) will maintain clean area temperatures at 75 (+/- 5 deg F), with relative humidity at 65% (maximum). Both plants will maintain higher tolerances during non-working periods.

2.0 APPLICABLE DOCUMENTS

The following documents of the latest effective revision become part of this procedure to the extent specified herein.

2.1 DRAWINGS

51065	Thematic Mapper Assembly
3933000-400	TM Interface Control
72611	Calibrator, TM
73003	Calibrator, Outline and Mounting
73623	Shipping Container, TM Instrument
R43839	Shipping Container, Calibrator (Zero Manufacturing Drawing)
73386	TM (Instrument) Handling Fixture
75323	TM Calibrator Handling Fixture

2.2 OTHER DOCUMENTS

TP32015-609	TM Cleanliness Plan
16174	TM Radiation Cooler, Contamination Control and Handling Requirements Specification
HS236-5827-1	TM System Integration and Test Humidity Control Plan
16357	SBRC Mechanical Assembly Area Control Specification
16309	Procedure for Handling the Graphite Epoxy Components of the Thematic Mapper to Control Exposure to Relative Humidity
HP 10-22	Controlled Areas Requirements
No. 209B	Federal Standard, TM Clean Room and Work Station Requirements: Protection, Cleaning, Torquing and Handling of Connectors
MIL-D-3464B	Desiccants, Activated, Bagged

SP80113 Rev C Packaging, Use and Static Dehumidification

3.0 GENERAL MOVING PRECAUTIONS AND PROCEDURES

3.1 EQUIPMENT REQUIREMENTS

TM (Instrument) Handling Fixture, No. 73386

TM Calibrator Handling Fixture, No. 75323

TM Instrument Shipping Container, No. 73623, with Handling Sling, No. 75484

TM Calibrator Shipping Container, with Cable Box, No. R43839

Clark 5-ton Mobile Crane (SBRC)

2-, 5-, 10-, and 20-ton Overhead Cranes (HAC)

2-ton Hydrosets

GN2 (filtered dry gaseous nitrogen) Purge Panel, Part No. 79346

Typical Class 10,000 Clean Room gear for personnel. To include "wrist stats" per SP80113, Rev. C, and gloves (nylon, No. 6854 or equiv, or "Sensiflex" vinyl or equiv)

Clear acrylic covers (3 ea) for louvers

Dust covers for all connectors

Aperture dust cover for the TM Instrument Sun Shade

Ground strap to Instrument (earth ground)

3.2 GENERAL MOVING PRECAUTIONS

Whenever a TM Instrument or TM Calibrator is to be moved, the specific mandatory precautions listed below for each type of move must first be adhered to before the actual move is made. Documentation of all moves must be made either on formal planning (AHR) or on attached data sheets (Section 4.5).

The TM Instrument or TM Calibrator shall be moved only by authorized personnel who are fully indoctrinated in the careful and safe handling of a TM Instrument and TM Calibrator. Compliance with Cleanliness Procedure TP32015-605 is mandatory.

Permission and coordination of all TM Instrument and TM Cal-

ibrator moves shall be the responsibility of the cognizant Test Director or a Test Team Member Delegate.

Cranes, whether overhead, A-frame or mobile, shall be operated only by personnel fully qualified in the use of the cranes, and the careful and safe handling of TM Instruments and Calibrators. Further, crane operators may not switch from one type of crane to another unless they are authorized to do so and totally familiar with its operation.

A hydroset must always be used between the crane and the handling fixture to enable careful raising or lowering of the TM Instrument or Calibrator.

Any time the Instrument is relocated to another mounting surface, the TM or magnesium plate mounting bolts shall be torqued to 50 ft-lbs with a QA witness present.

The TM shall be grounded to earth whenever possible during all moving and handling.

PERSONNEL:

The following list of personnel represents the minimum complement necessary to move a TM Instrument or Calibrator.

1. Instrument Engineer (delegated TM Test Team Member in charge of any move and issuing all instructions to the technicians and crane operator).
2. Technician (delegated SBRC Test Team Member)
3. Quality Assurance Representative (surveillance)
4. Authorized crane operator

3.3 SPECIFIC MOVING PROCEDURES

3.3.1 MOVING WITHIN A CLASS 10,000 CLEAN AREA

Prior to moving a TM Instrument or Calibrator, at any facility, several mandatory procedures must be observed:

1. Power applied to all equipment to be moved must be turned off.
2. External cabling must be disconnected or securely

stowed.

3. Radiative cooler door must be closed. The door will be taped in the closed condition if necessary.

4. All mechanical/optical adjustments must be secured.

5. Only TM authorized personnel shall handle the Instrument or Calibrator, per Paragraph 3.2 of this document.

6. Mount lifting fixture adapter to the TM Instrument's lifting hole pattern four places. Carefully insert the (4) 1/4" -28 x 1 1/2 (approx) socket head cap screws through the four red adapters and torque to 20 +/-5 in-lbs.

   Gently place the TM lifting fixture (shaped like a 4-pointed star) on the adapters and secure with red washers and 1/2 -13 nut. Torque to 10 +5/-0 ft. lb.

7. Carefully attach the crane, through a hydroset, to the fixture's lifting screw eye, which should be positioned at or near the Instrument's C.G.

8. Remove all fastening devices (clamps, screws, etc.) securing the Instrument to its mounting plate.

9. Before lifting, perform a detailed visual check of the Instrument, lifting fixture, crane and hydroset, and Instrument mounting plate.

10. After a satisfactorily visual examination, carefully lift the hydroset upwards in small increments until the crane's cables are just taut.

11. Again, examine the setup as in (3) above before proceeding to raise the Instrument.

12. Carefully raise the Instrument using the hydroset. Test Team Members should guide its movement manually at the direction of the Instrument Engineer.

13. Do not use the lift (crane) until the Instrument is suspended at least 0.25-inch min above its mounting surface.

14. Maintain the Instrument in as level position as practically possible when raising or lowering the Instrument.

15. In lowering the Instrument, repeat the steps above.

but in reverse order.

3.3.2 TM CALIBRATOR HANDLING

1. Carefully insert (4) threaded (3/8"-16) rods (two are 1-1/2" long and two are 19" long) into the TM Calibrator's handling hole pattern, torque to just beyond finger tightness.

2. Gently place the Calibrator handling fixture over the (4) protruding rods. Screw (4) 3/8" nuts and lock washers to the rods and torque to just beyond finger tightness.

3. Carefully attach the crane hook through a hydroset eye Attach the lower end of the hydroset to the fixture's lifting screw eye, which should be positioned at or near the Calibrator's C.G.

4. Before lifting, minutely examine the whole operation: For safety of personnel and Calibrator. (See Para 3.3.1 (8) above).

5. Carefully lift the hydroset upwards until the crane's cables are just taut.

6. Again examine the setup as in (4) above before proceeding to raise the Calibrator.

7. Lift the Calibrator while its movement is guided by other Test Team Members. (see Para. 3.3.1 (12), above).

8. Maintain the Calibrator in as level position as possible, when raising or lowering the Calibrator.

9. In lowering the Calibrator, repeat the steps above, but in a reverse order.

3.3.3

Moving from one Class 10,000 Clean Area to a Class 100,000 or higher within the same facility.

While still within a 10,000 clean area, all of procedures in Section 3.3.1 apply plus the addition of the following:

1. External cabling must be disconnected and/or securely stowed, as applicable.

2. The TM aperture cover, and the acrylic covers for the louvers must be installed.

3. The TM Instrument or Calibrator to be moved must be double bagged per Section 4.5. The bag shall be as completely sealed from the external environment as practical. The bag will be purged with filtered GN2 and carefully placed in its clean shipping container. See Para. 4.2 for handling instructions and precautions; or

4. The TM Instrument or Calibrator after being GN2 purged (with filtered dry nitrogen) must be double bagged, and placed on a card, or bottom half of designated shipping container. This double-bagged GN2 purged TM Instrument or Calibrator must not remain in an unclean area (i.e., any area higher in particle count than a Class 10,000 Clean Area) for longer than 8 hours, without being continuously purged.

3.4 PRECAUTION/PROCEDURES FOR LIFTING SHIPPING CONTAINER COVER

3.4.1

The following precautions shall be adhered to whenever the TM or Calibrator shipping container cover is lifted or stored.

PERSONNEL: Refer to Section 3.2 for minimum coverage.

LIFTING: Prior to lifting cover, storage container and GN2 supply bottles must be removed.

STORAGE: Whenever shipping container cover is off its base, the cover shall be suspended either by standoffs or similar devices to provide protection to the seals.

All purge ports shall be capped or covered during storage.

3.4.2

Prior to lifting or lowering a TM shipping container or Calibrator cover, at any facility, several mandatory procedures must be observed:

1. Remove contents of storage container. (CAUTION: SEE NOTE)
2. Turn GN2 supply off at the bottle.
3. Remove the GN2 supply bottles, depressurize container and unlatch all fasteners. (CAUTION: SEE NOTE)
4. Adjust lifting fixtures attachment point to enable cover to be lifted as level as possible.
5. Lock shipping container wheels.
6. Using overhead crane or similar device (1-ton minimum), lift shipping container in small increments of 3" to 6" until half of Instrument is in full view.
7. When lowering shipping container cover, lower slowly until half of the Instrument is covered.

   Continue to lower cover using 3" to 6" increments until cover is on its base or standoffs.

NOTE

Handling sling on shipping container cannot be adjusted to handle loads in the storage container. It is mandatory that everything in the storage area be removed.

4.0 SHIPPING PREPARATIONS AND PROCEDURES

4.1 MOVING EQUIPMENT

TM (Instrument) Handling Fixture, No. 73385

TM Calibrator Handling Fixture, No. 75323

TM Instrument Shipping Container, No. 73623, with Handling Sling, No. 75484

TM Calibrator Shipping Container, with Cable Box, No. R43839

Clark 5-ton Mobile Crane (SBRC)

2-, 5-, 10-, and 20-ton Overhead Cranes (HAC)

2-ton Hydrosets

GN2 (filtered dry gaseous nitrogen) Purge Panel, Part No. 79346

Typical Class 10,000 Clean Room gear for personnel. To include "wrist stats" per SPS0113, Rev. C, and gloves

(nylon, No. 6854 or equiv, or "Sensiflex" vinyl or equiv)

Clear acrylic covers (3 ea) for louvers (not to be installed if unit is to be shipped to acoustic or vibration testing).

Dust covers for all connectors

Aperture dust cover for the TM Instrument Sun Shade (may use approved plastic sheet in place of dust cover)

Ground strap to Instrument (earth ground)

Clean Room garments

68 Units minimum of sulfur-free desiccant, fresh and dry (reactivated) required for each TM shipping container

Filtered GN2 for transportation container purging, using a 5-micron SBRC molecular sieve filter P/N 5684

GN2 filter-flow module (FFM) for TM Instrument purge, consisting of 5-micron SBRC molecular sieve filter P/N 5684 and 0.2 micron Gelman pleated capsule filter P/N 12106

Polyethylene plastic sheet, 6 mil, type RCAS-1200, nylon anti- static plastic sheet, 2 mil, type RCAS-2400

Scotch tape, type (3M) 8402 anti-static adhesive tape, or equivalent

Isopropyl alcohol, Grade A

4.2 TRANSPORT EQUIPMENT

1. Air-ride, closed, side-load van with greater than 10 ft wide doors, tie-down straps and wall fasteners. Lift-gate type air-ride truck may be used for test equipment or Calibrator only, width of gate to be greater than or equal to 76 inches.

2. Fork-lift truck 5-ton capacity with 60" blades.

4.3 SHIPPING CONTAINER PREPARATION FOR TM AND CALIBRATOR

1. Prior to using a TM shipping container it must be examined for cleanliness in a clean area (10,000 or better). The inside of the TM shipping container shall be thoroughly vacuumed before it is to be used. Special attention shall be paid to the rubber seal around the periphery of the base for cracks or foreign particles which could affect a good pressure seal. If necessary, a nylon wiping cloth with isopropyl alcohol shall be used to clean the rubber seal area.

2. Dry desiccant bags will be used during TM Instrument and TM Calibrator transportation. These bags shall be reactivated by baking for 12 hours (min) at 245 to 275 deg F prior to being placed in a TM shipping container. A minimum of 88 units (11 bags) of desiccant are required to meet MIL-D-34643 requirements.

3. Each TM shipping container (Instrument and Calibrator) contains a shock indicator which shall be set with a new unused roll of recording paper before each trip.
each trip.

4.4 TEST EQUIPMENT PACKAGING

1. The test consoles and test equipment shall be wrapped in a single layer of polyethylene sheeting, which is taped securely in place. But first, any miscellaneous cabling, jumper connections, pass filters, etc., (outboard miscellaneous equipment), must be removed and stored in the console drawers. All drawers will then be taped shut.

2. All external cabling shall be transported in specially designated cable boxes. Each box will be identified by the cabling name(s) and part number(s) of its contents. Each box should be examined for cleanliness, and the inside shall be vacuumed before it is used.

3. Cabling that will be used inside the thermal vacuum chamber shall, after being cleaned, be bagged in polyethylene bags and also placed inside the respective cable box.

4. All cabling connectors shall be protected by bubble pack coverings.

4.5 SHIPPING PROCEDURE AND CHECK-LIST

The following procedures apply to both the TM Instrument and its Calibrator.

BAGGING PROCEDURES:

The bagging procedure shall commence at the direction of Top Assembly AHR 31065, Part 1, Part 2, etc. Quality Assurance will be responsible for verification of each specific task. All these operations shall be performed in a Class 10,000 clean area whenever possible. Both instruments shall be hard mounted.

Masking of the cable connectors and handling fixtures may be optional at the discretion of the Instrument Engineer.

1. Lay bagging material (two (2) bags) on mounting pads of shipping container or mag plate, with the inner bag on top. A third bag (polyethylene) or barrier bag per MIL-B-131 will be required if unit is to be air-freighted.

A) Use nylon "C" anti-static plastic sheet, RCAS 2400 (2 mil) for inner bagging material.

B) Use polyethylene plastic sheet RCAS1200 FR (6 mil) for outer bag(s), or barrier bag per MIL-B-131.

C) Bagging material shall be patterned in such a way that, when sealed, it encloses the entire unit, and is as air-tight as practical.

_____	_____
_____	_____
_____	_____
Verify	Date

2. Cut clearance holes at the mag plate (TM mounting interface) or shipping container mounting locations for mounting bolts through both materials three (3) places and tape plastic sheeting to the shipping container at the three locations. ASSURE THAT NO PLASTIC SHEETING COVERS THE SHIPPING CONTAINER MOUNTING LOCATIONS using approved Clean Room tape shall be used.

_____	_____
_____	_____
_____	_____
Verify	Date

3. Mate TM Instrument or Calibrator to shipping container (refer to Handling Fixtures/Procedures of Sections 3.2 and 3.3.1 through 3.3.3.).

_____	_____
_____	_____
_____	_____
Verify	Date

4. Torque mounting bolts to 50 ft-lbs, and install protective covers wherever applicable.

_____	_____
_____	_____
_____	_____
Verify	Date

5. Mask purge connections, BTCE cable connectors, and handling fixture mounts to inner BPC, with Clean Room-approved tape for Instrument testing and handling outside class 10,000 clean areas. (for TM Instrument only)

_____ _____
_____ _____
_____ _____
Verify Date

6. Purge inner bag with GN2 for a minimum of 30 minutes at 25 to 35 CFH using purge panel P/N 79346.

_____ _____
_____ _____
_____ _____
Verify Date

7. Evacuate bag (filled with GN2) using a vacuum cleaner or similar device prior to sealing inner bag with Clean Room- approved anti-static tape or pulse heat sealer.

_____ _____
_____ _____
_____ _____
Verify Date

8. Mask purge connections to outer bag.

_____ _____
_____ _____
_____ _____
Verify Date

9. Purge outer bag (polyethylene) with GN2 for a minimum of 30 minutes at 25 to 35 CFH. Use purge panel P/N 79346.

_____ _____
_____ _____
_____ _____
Verify Date

10. Evacuate GN2 from bag prior to heat sealing outer bag or use Clean Room-approved anti-static tape. (see operation No. 7)

_____ _____
_____ _____
_____ _____
Verify Date

11. Repeat Steps 9 and 10 if third bag is used (air transport indicated).

_____ _____

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Verify	Date

12. Secure 88 units (minimum) of activated sulfur-free desiccant to the floor of the shipping contianer.

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Verify	Date

13. Place 83 units of activated sulfur-free desiccant into the desiccant holder on the cover of the shipping container.

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Verify	Date

14. Secure graphite witness samples, and shock recorder with clear unused recording paper to the shipping container.

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----------	----------
Verify	Date

15. Lift shipping container cover and carefully lower over TM unit. Secure all latches. (See Section 3.4 for detailed operation and procedures)

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Verify	Date

16. With relief valve opened, purge shipping container for a minimum of two (2) hours or until humidity indicator turns blue, indicating at least 30% humidity. Purge with GN2 using purge panel P/N 79346.

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----------	----------
----------	----------
Verify	Date

17. Close relief valve and turn on shipping container purge system. Verify internal pressure is approximately 0.20 PSI maximum.

_____	_____
_____	_____
_____	_____
Verify	Date

NOTE

The following steps apply only if unit is to be air-freighted.

18. QA and delegated Test Team Members will accompany shipping container to cargo bay of air transport.

19. Prior to loading, delegated Test Team Member will turn GN2 supply off at the nitrogen bottles and depressurize container by rotating external knob on relief valve to enable it to be a two-way breather valve.

_____	_____
_____	_____
_____	_____
Verify	Date

20. After final check to see if container is secured and ready for transport, QA will install break and entry seal on relief valve (breather valve).

_____	_____
_____	_____
_____	_____
Verify	Date

21. Shipping container wheels shall be locked after loading into cargo bay.

_____	_____
_____	_____
_____	_____
Verify	Date

22. Immediately upon arrival of Instrument, QA and a delegated Test Team Member shall close relief valve and re-pressurize the TM shipping container to 0.2 psig max.

_____	_____
_____	_____
_____	_____
Verify	Date

4.6 LOADING/UNLOADING PROCEDURES, GENERAL PRECAUTIONS/ RESPONSIBILITIES

1. All TM equipment (Mapper, Calibrator and associated equipment) shall be loaded and unloaded under the supervision of the Instrument Engineer or the responsible Test Director and under surveillance of the resident Quality Assurance Engineer. Moving and handling will be done by the responsible test team members. The fork lift shall lift shipping container on the side opposite the pressure gauges only.

2. The TM Calibrator shipping container shall be carefully wheeled onto the truck lift gate and the container wheels blocked to keep it from rolling when the lift gate is being raised.

3. Inside the truck, shipping containers, test consoles and associated equipment shall be wrapped in protective blankets, securely strapped down and anchored to the walls of the truck. Cable boxes, support bases and miscellaneous equipment must be securely placed in the truck so that they will not move during travel.

4. Loading and unloading will be principally conducted by HAC rigger personnel, with the responsibility of the HAC Liaison Project Engineer. It always remains the responsibility of the Cognizant Test Director, Instrument Engineer, or a Test Team Member Delegate to see to the safety, cleanliness and order of the handling of all TM equipment.

   AT HAC:
   ------

5. After the TM equipment is unloaded, responsible Test Team members will move the TM equipment to its next area of operation. The equipment shall then be unpacked carefully.

   AT GSFC:
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6. Loading and unloading also becomes the responsibility of the Cognizant Test Director, Instrument En-

gineer, or a Test Team Member Delegate.

AT REMOTE ACOUSTIC FACILITY:

AT GE: (Same as at GSFC)

5.0 TRIP COORDINATION PROCEDURES AND SHIPPING DOCUMENTATION

5.1

At SSRC, the cognizant Test Director or a Test Team Member Delegate shall be responsible for coordinating the departure, arrival and in-plant movement of all TM equipment; in addition, he shall coordinate and/or make the necessary shipping arrangements.

5.2

The Cognizant Test Director or a Test Team Member Delegate must communicate with HAC Receiving Department to schedule the arrival and/or departure of TM equipment, thereby avoiding or minimizing unnecessary delays at the HAC loading dock.

5.3

When transporting TM equipment to and from the remote acoustic facility, the Cognizant Test Director or a Test Team Member Delegate will ensure the TM equipment safety, cleanliness and order of handling, and will make all the necessary arrangements.

5.4 SHIPPING DOCUMENTATION

5.4.1 RESPONSIBILITY TO GENERATE SHIPPING DOCUMENTS

The Cognizant Test Director or a Test Team Member Delegate shall be responsible for generating the necessary shipping documentation, at least one day prior to the date of shipment.

5.4.2

The delegated Test Team Member will fill out a "Request for Shipment" describing all items to be transported by name and part number (SSRC Form 052-Rev. 3-72).

5.4.2.1

If requested, indicate on the "Request for Shipment" the requirement for a Form DD250 or DD1149. This form will then be generated by SBRC Shipping Department for the following reasons:

1. DD250 - Equipment constituting a final shipment to the Government.

2. DD1149 - Equipment on loan from the Government or being returned to the Government, after having been shipped once before on a DD250 form.

5.4.3

Each form, DD250 or DD1149, must be accompanied by a separate SBRC Packing List listing only the equipment applicable to that respective form. Consequently, the originator of the "Request for Shipment" may be required to fill out more than one "Request", as applicable.

5.4.4

The "Request for Shipment" shall be presented to the Shipping Department, from which they will type up a packing list.

5.5

Quality Assurance shall review and approve the applicable TM shipping documents (See Paragraph 7.1 of this document), and obtain the necessary approval signatures prior to shipping.

Then QA will return completed and signed documents to the SBRC Shipping Department and notify the responsible Test Director or a Test Team Member Delegate that the shipping documentation has been cleared and the TM equipment can now be loaded.

1. In reviewing the packing list, the QA Engineer shall determine if there are any deviations or open Failure Reports, and if so, make any necessary corrections.

2. At least three (3) copies of the completed documentation must accompany the TM shipment.

6.0 STORAGE AND CONTAMINATION CONTROL

6.1 TM INSTRUMENT/CALIBRATOR STORAGE

When the TM Instrument or Calibrator is not under test for a period over 48 hours, it shall be stored under one of the following conditions.

6.2

1. In a Class 10,000 clean environment, it may remain unbagged; and
2. In a Class 100,000 clean environment or higher, it must be

   Double-bagged per Section 4.5, Para. 1: Continuously GN2 purged at 25 to 35 cfh while maintaining a positive nitrogen pressure; or

   Installed in its shipping container, which is pressurized to 0.2 psig (approx) with dry filtered GN2.

6.2.1

As any of the three TM Scanners are shipped from SBRC to El Segundo and subsequently to GE at Valley Forge, consideration should be given to a method for continuing surveillance of the strain level of the graphite epoxy composite optical metering structure (OMS).

The following plan appears the most practical approach to the problem:

A) Maintain a constant purge of GN2 gas simultaneously through the aperture and main frame purge port to keep the OMS as dry as possible. Interrupt purging only when specific test configurations prevent it, then resume purge at once.

B) Monitor the ambient temperature and relative humidity by locating a 24-hr. or

7-day chart recorder in the proximity of instruments. Indicate on the chart paper when purging to the scanner was started and when it was interrupted.

C) This composite data will be an input into an existing computer program to determine the strain value of the OMS. If this plan is to be of value, these records must be kept accurately and without interruption.

6.3 TM TEST EQUIPMENT STORAGE

All other TM test equipment will be stored according to approved SBRC or HAC procedures, as applicable.

6.4

Contamination control shall be achieved by compliance with the TM Cleanliness Plan, TP32015-605.

7.0 QUALITY ASSURANCE PROVISIONS

7.1 RESPONSIBILITIES

7.1.1 AT SBRC

Audit of the requirements herein, as they relate to the TM Instrument: Shall be the responsibility of SBRC Quality Assurance.

7.1.2 AT HAC

The responsibility for auditing compliance with this document shall be SBRC Quality Assurance.

7.1.3 AT GSFC OR G.E.

The GSFC or G.E. Quality Assurance Laision will have the responsibility of monitoring compliance of this document.

7.1.4 AT REMOTE ACOUSTIC FACILITY

The SBRC Quality Assurance again has the responsibility of auditing the compliance with this document.

7.1.5 ADDITIONAL QUALITY ASSURANCE TM RESPONSIBILITIES

All Quality Assurance responsibilities mentioned above, and elsewhere in this document, shall also include:

1. Review and approval of shipping documents.
2. Determine if any deviations or open Failure Reports are to be noted on the documents, and if so, make the necessary corrections.
3. Procurement of other shipping approval signatures.
4. Notify Responsible Test Director or Test Team Member Delegate when TM equipment is cleared to be loaded for shipment.

Section 6.0

Preshipment Review Presentation Charts

6.0 PRESHIPMENT REVIEW PRESENTATION CHARTS

The series of charts included in Attachment One to this volume were used during a presentation of the Flight Model Preshipment Review data. The intent of the meeting was to present data that showed the performance characteristics of the Flight Model Thematic Mapper, comparing the actual performance with the specified performance; to review the series of tests performed on the Flight Model; and to briefly review the test programs conducted on specific subsystems. Liens that were generated during the course of fabrication or testing that were of major consequence (i.e., from a performance standpoint) were reviewed.

The material presented in Sections 1.0 through 5.0 of this volume with the subsystems, system and supplemental data presented in Volumes II, III, and IV of this report respectively, served as supplemental data during the review.

END

DATE

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AUG 5 1983